



Enhancing access to green electricity in Africa – The role of off-grid and mini-grids

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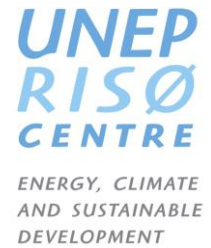
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Enhancing access to green electricity in Africa – The role of off-grid and mini-grids

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Energy is key to greening the growth
Danida Development Days
29 May 2013

Outline of Presentation

- The green access challenge
- Technical, economic and organisational options
- Key Issues for national electrification programs
- Key Issues for international support



Understanding access

AGECC concept

- 1) Basic human needs
 - lighting, health, communication
 - 50-100 kgoe of modern fuel or improved cook stove
- 2) Productive use
 - irrigation, food processing, cooling
- 3) Modern society needs
 - domestic appliances, heating, cooling

Energy plus approach

Holistic approach
addressing access +
general development issues

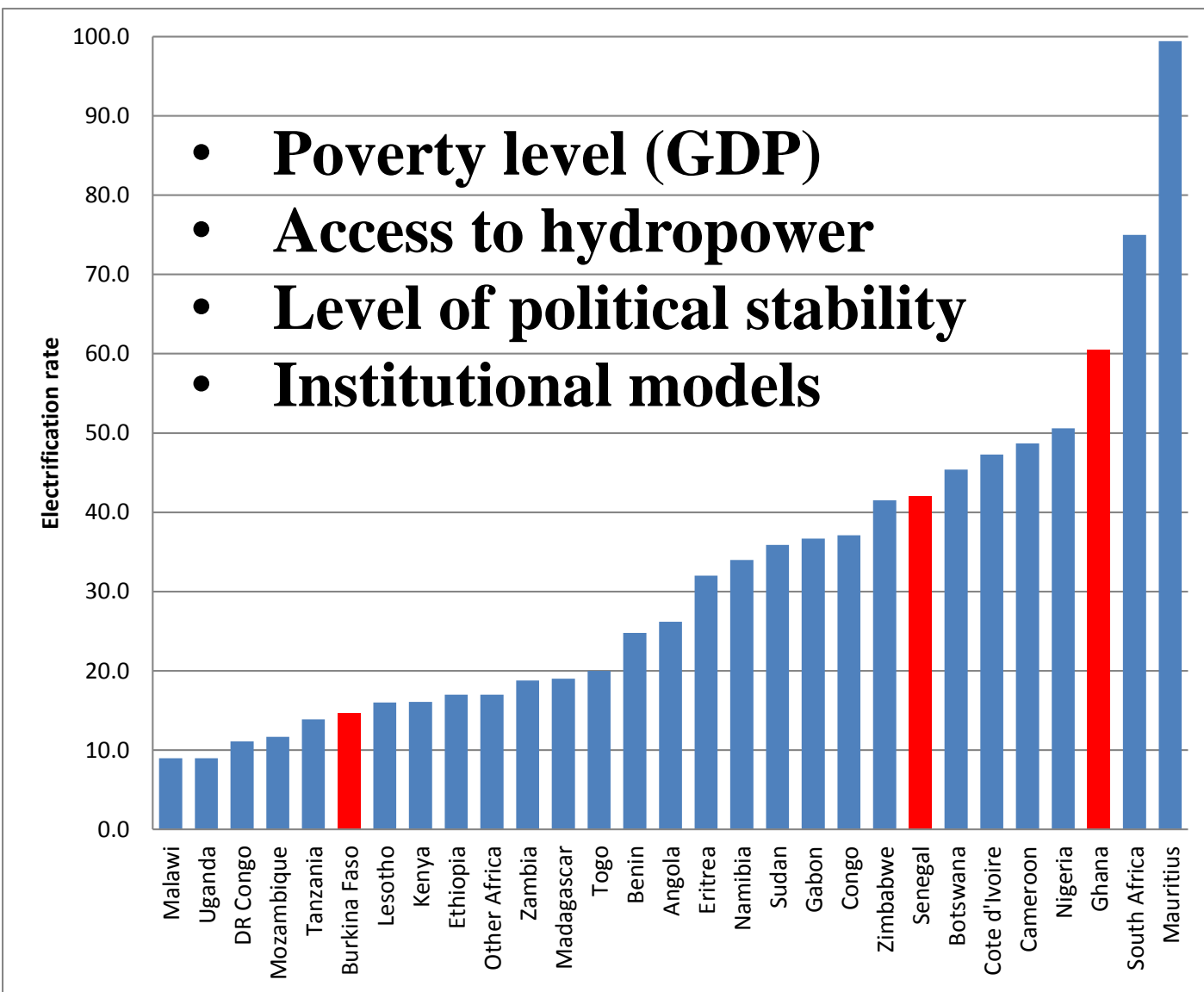


Reduced poverty
Basic needs + increased
affordability

Focus on electrification in Africa

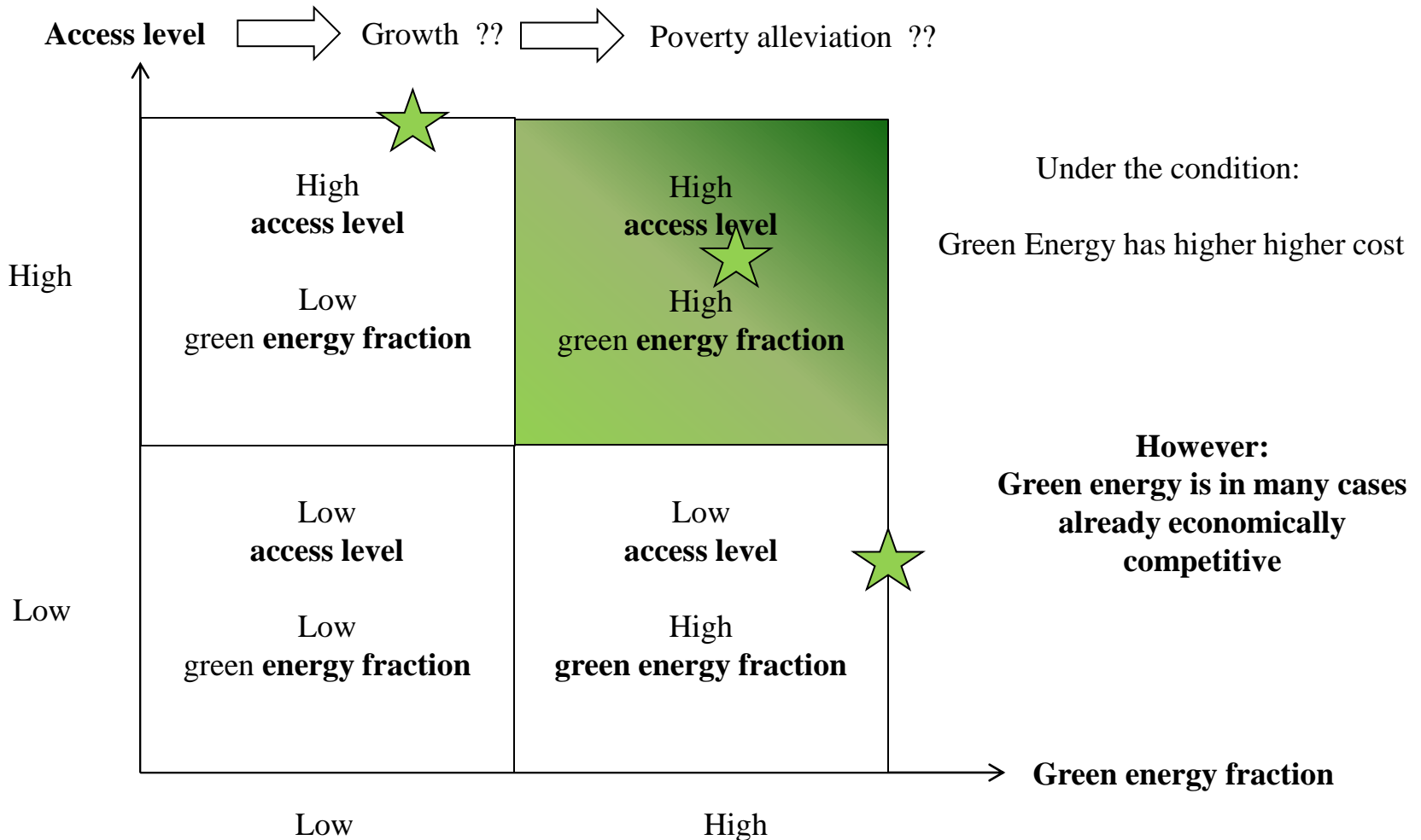
- Half of the population – approx. 500 million - living on the African continent have no access to electricity today
- Without dedicated national and international action this number will increase and in 10 years half of the people in the world without access to electricity will be on the African continent
- For most African countries the “ultimate access objective” is to provide electricity to the whole population
- Focus on electricity does not imply that other options for clean energy services are not important and many will play a crucial role in an integrated access strategy

Electricity access in 2009



Source: IEA, World Energy Outlook, New electricity access database, 2011

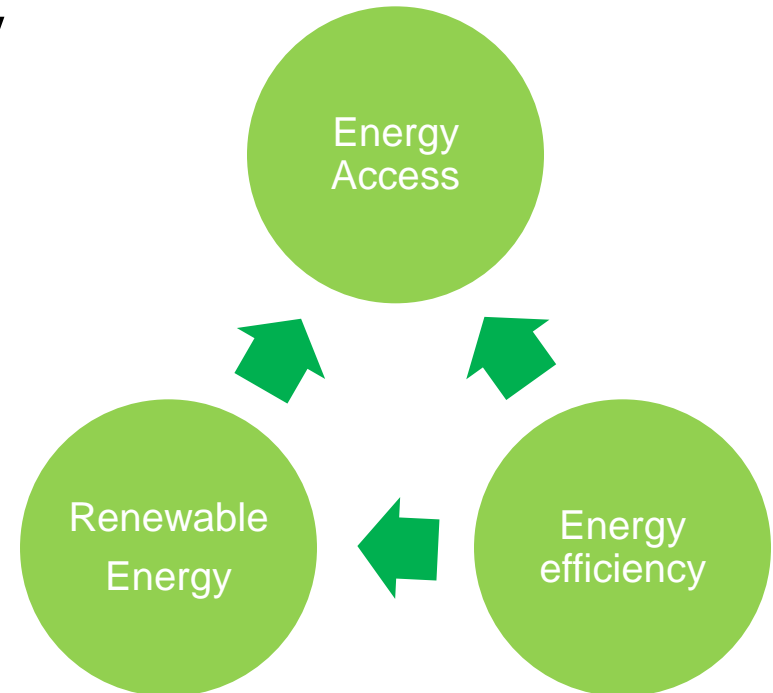
The green access challenge



A triple objective approach

Access, renewables, efficiency

- In cases where renewables are the cheapest option renewable energy can increase access
- Energy efficiency is important and beneficial in small systems with high electricity cost
- Energy efficiency can though cost reduction increase access



Experiences and data sources

Main sources

- Enhancing access to electricity for clean and efficient energy services in Africa. Draft policy paper elaborated by Christensen, Mackenzie, Pedersen (2012)
 - Morocco, Ghana, SA
 - Club ER
- Feasibility of Renewable Energy sources in Mali (2009-12)
- Close contact to Rural Electrification agencies in Mali, Senegal (2009-2012)
- Experience from implementing rural electrification in Burkina Faso in 2001 and 2007

Additional sources

- Rural electrification planning in Cameroun, Mali, Burkina Faso and Cote D'Ivoire (2006)
- Business Models for Rural Electrification from Agro-Industries - The Case of Kenya, Tanzania, Rwanda, and Malawi (2010)
- Technology needs assessment project in:
 - Sudan Morocco, Senegal, Mali, Cote D'Ivoire, Ghana, Kenya, Rwanda, Zambia, Mauritius,

The role of off-grid and mini-grid:

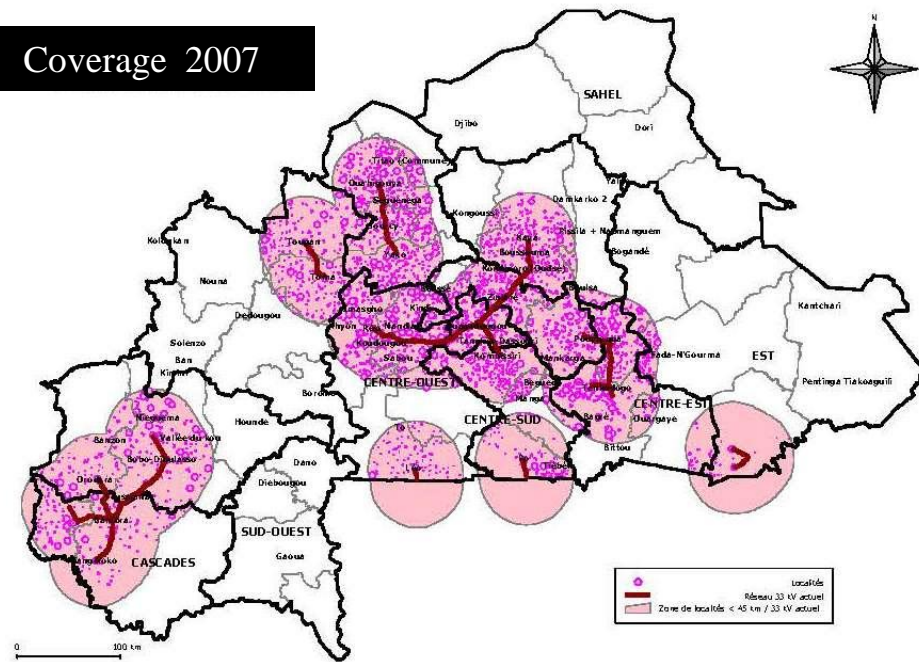
Technical, economic and organizational options

Spatial delimitation, markets and technologies

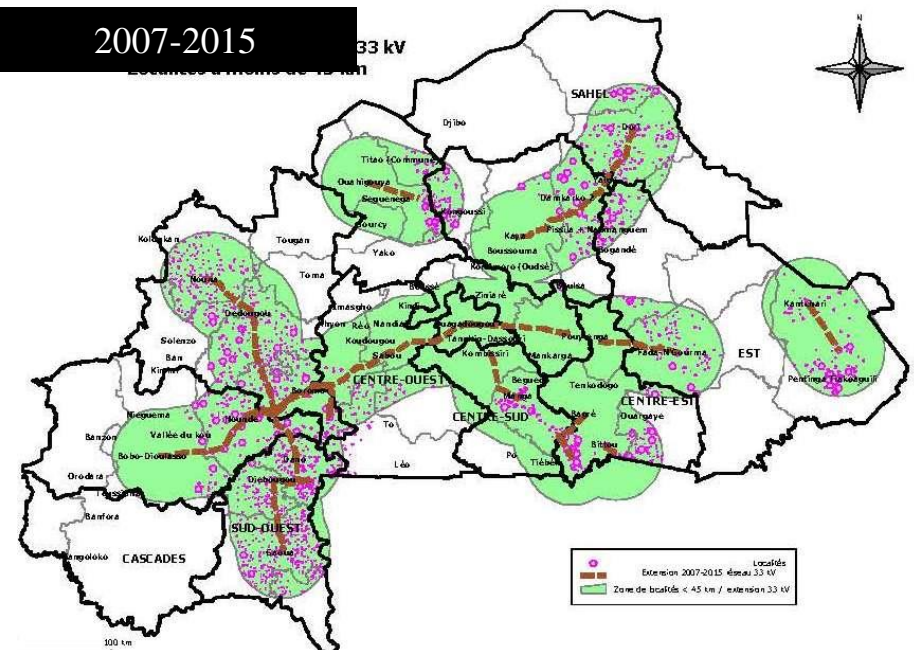
- Criteria
 - Distance, Demand, Density
- Grid
 - Hydro, Wind, Solar, Biomass, Geothermal
- Mini-grid
 - Hybrids: Micro-hydro, PV, Wind, Biofuel, Biogas, gasification,
- Off – grid
 - Solar PV, Windpumps

Source: MMCE (2008). Vision 2020 de l'accès aux services énergétiques modernes au Burkina Faso. Projet MEPRED 2008 financed by EU, UNDP and DANIDA

Coverage 2007



2007-2015



Emerging Technological and Market Opportunities

Mini-grids

- Hybrid-systems
 - Mali: 5 PV-systems, 45 PV and biodiesel planned
 - Senegal: 10 PV systems
- Smart grids
 - Life-link, mobile phones
 - Surveillance, payment systems, organisational changes
- Energy efficiency
 - LED lighting
 - Efficient air-con, fridges



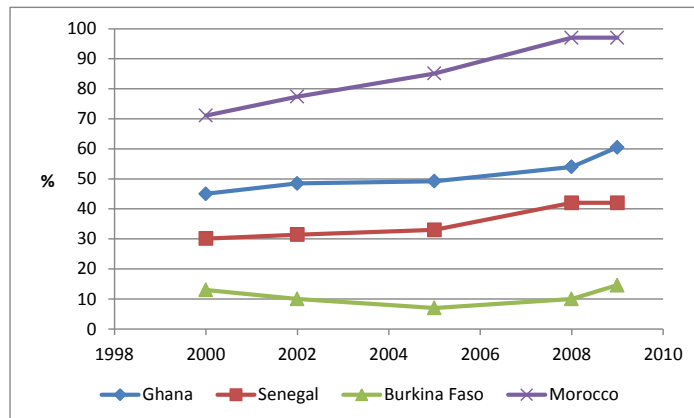
Off-grids

- Solar Home Systems
 - Significant price reduction
 - Local assembly/production
 - Senegal
 - Modular investment
 - Market based diffusion
 - Kenya
 - Low cost engines
 - Solar lanterns
- Energy efficiency
 - LED (lamps, TV, computers)
 - Low cost inverters

Approaches to mini-grid electrification and local participation/ownership

Rural electrification approaches

Country	Approach			Elect. rate
Morocco	Utility	Conces- sion	Municipality	98
Ghana	Utility		Selfhelp scheme	60
Senegal	Utility	Conces- sion	Spontaneous private	42
Mali	Utility	Conces- sion	Spontaneous private	11?
Burkina Faso	Utility		Planned cooperatives	15



Community ownership hybrids

- Morocco: Joint ownership**
 - Utility, 20 %, Cross subsidy, 35 %, Municipality 20 %, consumer 25 %. Concessionaire: build and operate contract
- Ghana: Self-help village committee**
 - Government ownership. Utility operation. Show commitment by buying poles and 30 % wiring
- Mali - Senegal: Spontaneous private/Comm**
 - Showing interest to a private operator
 - Private operator responsible for operation and maintenance
- Burkina Faso: Planned cooperative**
 - Responsible for ownership and operation with outsourcing of responsibility to private operator

Utility

Opportunities

- Access to technical expertise
- Economy of scale
- Opportunities for cross subsidizing from urban to rural

Challenges

- Often conservative in approach (e.g. SWER)
- No tradition for community involvement
- Seen as part of the state by consumers
- Often "negative" political influence

Concessions

Opportunities

- Access to international knowhow and finance
 - ONE, EDF
- Economy of scale
 - in investment
 - in operation
- Favours innovative systems
 - such as hybrid PV/diesel

Challenges

- Time consuming to prepare tender material and conditions
 - six concessions in Senegal after 10 years
- Difficult to attract foreign/local investors
 - The concession system has been abandoned in Mali due to that reason
- Size of concessions
 - Mali (8 +10), Senegal (10)
- Verification and control

Community participation


Opportunities

- More democratic
- Ensuring local needs
- Easy access to land for poles and lines
- Donor-support
 - Support from donor constituencies

Challenges

- Expertise
 - technical, financial
- Poverty level
 - high subsidy rates necessary
- Commitment/dependency
 - high subsidy rate
- Financial management
 - Satisfaction of other needs
- Local conflicts

Organisational challenges for off grid electrification

Model	End-user	Ownership	Financing provided by	Subsidy level for investment	Responsible for installation, maintenance and after sales service
Donation	Institutions	End-user	Donor	High, 100 %	End-user, committees
Commercially led delivery model (cash sale) 	Private	End-user	End user	Zero	End user
Multi stakeholder programmatic model (credit)	Private	End-user	Donor, financing institution, dealer, end-user	Low to medium	Depends on circumstances
Fee for service (dealer model)	Private, Institutions	Utility, Energy Service Company (ESCO)	ESCO	Medium to high	ESCO
Fee for service (concession model)	Private, Institutions	Utility, ESCO	ESCO	Medium to high	ESCO

Nygaard, I. (2009): Compatibility of rural electrification and promotion of low-carbon technologies in development countries - the case of Solar PV for Sub-Saharan Africa. European Review of Energy Markets. Vol 3, No 2, 125-158.



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ENERGY, CLIMATE
AND SUSTAINABLE
DEVELOPMENT

Key issues for national electrification programs and for international support

Key Issues for National Electrification Programs I

- Political commitment
 - strong and sustained
 - supporting factors
 - Local political pressure
 - Champions
 - International dialogue and targets
- Integrated national "vision"
 - Long term vision
 - Balance central grid, mini-grid and off-grid
- Institutional strength
 - No superior model for electrification
 - A strong central institution is key
- Finance challenge
 - beyond current resources
 - planning, institutional strengthening, subsidies
 - PPPs crucial for engaging private sector

Key Issues for National Electrification Programs II

- Stimulating productive use
 - Focus from the start
 - Multi-sector involvement necessary
- Role of Renewable Energy
 - Stand alone PV, social use but not productive use
 - Mini grids with hybrid systems as an intermediate solution
 - Central systems dominated by hydro. Wind, Solar and biomass close to grid parity
- Pro-poor subsidies and tariffs
 - Subsidies needed
 - Full cost recovery
- Design for gradually build up
 - Mini-grids to build up electricity markets
 - Bundling introduction of hybrid systems
 - Avoid non-coordinated pilots
 - Integrate electricity and development efforts

Key Issues for international support

- **Creating political momentum**
 - Energy year campaign, AGECC, E4all
 - Social and Development benefits
 - Regional dialogues
- **Institutional and policy support**
 - Differentiated support for Institutional strengthening
 - Private sector, local government, community engagement
- **Stimulating regional cooperation**
 - AU, regional communities,
 - Power pools
 - EU – Africa Energy
- **Providing increased and targeted financing**
 - grant funding for visions, institutional strengthening, subsidy schemes
- **Enhanced donor coordination**
 - Massive scale up contingent on efficient collaboration
 - Priority including funding from all relevant multilateral organisation
- **Internal donor coherence**
 - Priority on energy and access in broader development programs
 - Long term engagement as important for donors as for countries

Thanks for your attention !

